



**MAY 03 2006**

**LR-N06-0208**

**U. S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, DC 20555**

**LER 272/06-001-00  
SALEM - UNIT 1  
FACILITY OPERATING LICENSE NO. DPR-70  
DOCKET NO. 50-272**

This Licensee Event Report, "Salem Unit 1 Turbine Trip – Reactor Trip with Reactor Power Above P-9," is being submitted pursuant to the requirements of the Code of Federal Regulations 10CFR50.73(a)(2)(iv)(A).

The attached LER contains no commitments.

Sincerely,

A handwritten signature in black ink, appearing to read "Thomas P. Joyce", written over a horizontal line.

Thomas P. Joyce  
Site Vice President - Salem

Attachment

/EHV

*JE22*

**MAY 03 2006**

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LR-N06-0208

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C    Mr. S. Collins, Administrator - Region I  
      U. S. Nuclear Regulatory Commission  
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      King of Prussia, PA 19406

Mr. S. Bailey, Licensing Project Manager – Salem  
U. S. Nuclear Regulatory Commission  
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USNRC Resident Inspector Office – Salem (X24)

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Bureau of Nuclear Engineering  
P. O. Box 415  
Trenton, NJ 08625

## LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (1-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to [infocollects@nrc.gov](mailto:infocollects@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

## 1. FACILITY NAME

Salem Generating Station - Unit 1

## 2. DOCKET NUMBER

05000272

## 3. PAGE

1 OF 4

## 4. TITLE

Salem Unit 1 Turbine Trip - Reactor Trip with Reactor Power Above P-9

6. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	08	2006	2006	001	00	05	03	2006	FACILITY NAME	DOCKET NUMBER

## 9. OPERATING MODE

1

## 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)

## 10. POWER LEVEL

100%

- |   |   |  |  |
|---|---|--|--|
| <input type="checkbox"/> 20.2201(b)         | <input type="checkbox"/> 20.2203(a)(3)(i)   | <input type="checkbox"/> 50.73(a)(2)(i)(C)             | <input type="checkbox"/> 50.73(a)(2)(vii)        |
| <input type="checkbox"/> 20.2201(d)         | <input type="checkbox"/> 20.2203(a)(3)(ii)  | <input type="checkbox"/> 50.73(a)(2)(ii)(A)            | <input type="checkbox"/> 50.73(a)(2)(viii)(A)    |
| <input type="checkbox"/> 20.2203(a)(1)      | <input type="checkbox"/> 20.2203(a)(4)      | <input type="checkbox"/> 50.73(a)(2)(ii)(B)            | <input type="checkbox"/> 50.73(a)(2)(viii)(B)    |
| <input type="checkbox"/> 20.2203(a)(2)(i)   | <input type="checkbox"/> 50.36(c)(1)(i)(A)  | <input type="checkbox"/> 50.73(a)(2)(iii)              | <input type="checkbox"/> 50.73(a)(2)(ix)(A)      |
| <input type="checkbox"/> 20.2203(a)(2)(ii)  | <input type="checkbox"/> 50.36(c)(1)(ii)(A) | <input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A) | <input type="checkbox"/> 50.73(a)(2)(x)          |
| <input type="checkbox"/> 20.2203(a)(2)(iii) | <input type="checkbox"/> 50.36(c)(2)        | <input type="checkbox"/> 50.73(a)(2)(v)(A)             | <input type="checkbox"/> 73.71(a)(4)             |
| <input type="checkbox"/> 20.2203(a)(2)(iv)  | <input type="checkbox"/> 50.46(a)(3)(ii)    | <input type="checkbox"/> 50.73(a)(2)(v)(B)             | <input type="checkbox"/> 73.71(a)(5)             |
| <input type="checkbox"/> 20.2203(a)(2)(v)   | <input type="checkbox"/> 50.73(a)(2)(i)(A)  | <input type="checkbox"/> 50.73(a)(2)(v)(C)             | <input type="checkbox"/> OTHER                   |
| <input type="checkbox"/> 20.2203(a)(2)(vi)  | <input type="checkbox"/> 50.73(a)(2)(i)(B)  | <input type="checkbox"/> 50.73(a)(2)(v)(D)             | Specify in Abstract below<br>or in NRC Form 366A |

## 12. LICENSEE CONTACT FOR THIS LER

## FACILITY NAME

E. H. Villar, Senior Licensing Engineer

## TELEPHONE NUMBER (Include Area Code)

856-339-5456

## 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
			-						

## 14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE)☒ NO

## 15. EXPECTED SUBMISSION DATE

MONTH

DAY

YEAR

## ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On March 8, 2006 at 1109, with Salem Unit 1 at 100 % power, a turbine trip signal was received in the main control room with an immediate reactor trip. The reactor trip actions and plant recovery were performed without complications. Analysis of computer data indicated that the turbine over speed circuit initiated an overspeed signal at 103% and tripped the main turbine as designed. Turbine speed was a constant 1800-rpm as controlled by the electric grid with the generator synchronized to it.

The most probable cause of the turbine trip reactor trip was Radio Frequency Interference (RFI) or Electro Magnetic Interference (EMI) by an unknown source. Some of the corrective actions taken were the following: (1) prohibiting the use of electric tools, radios, cellular phones, portable radios, arc flash welders and other equipment that could result in EMI or RFI in relay rooms and (2) posting warning signs in the effected areas.

This report is being made in accordance with 10CFR50.73(a)(2)(iv)(A), "any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B)."

## LICENSEE EVENT REPORT (LER)

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## 17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

## PLANT AND SYSTEM IDENTIFICATION

Westinghouse - Pressurized Water Reactor

Electro-Hydraulic Control System (TG){EHC}  
Steam Generator Feed Pump (BF/P) {SGFP}  
Control Rod System (AA/-)

Industry Identification System (EIS) codes and component function identifier codes appear in the text as {SS/CCC}.

## IDENTIFICATION OF OCCURRENCE

Event Date: March 8, 2006

Discovery Date: March 8, 2006

## CONDITIONS PRIOR TO OCCURRENCE

Salem Unit 1 was in Operational Mode 1 at 100% reactor power.

No structures, systems or components were inoperable at the time of the discovery that contributed to the event.

## DESCRIPTION OF OCCURRENCE

On March 8, 2006 at 1109, with Salem Unit 1 at 100% power, a "first-out" Overhead Alarm (F38) Turbine Trip & P-9 (Reactor above 49% power) was received in the main control room with an immediate reactor trip. The reactor trip actions and plant recovery were performed without complications; however, two equipment issues were noted during the trip. The two issues were: (1) one control rod position indication for shutdown rod 1SC1 indicated that the rod was at approximately 17 steps, and (2) reports from field operators (non-licensed personnel) indicated a leak on the condensate line at the suction of the 11 Steam Generator Feedwater Pump. Control room operators (Licensed personnel) initiated a Main Steam Line Isolation to isolate steam flow to the secondary plant and controlled Reactor Coolant System average temperature using the atmospheric dump valves. The leak on the condensate line was due to the momentary secondary system pressure perturbation that caused a flange gasket to fail. The failed gasket was replaced.

Later assessments determined that control rod 1SC1 was fully inserted. The erroneous 1SC1 position indication was the result of residual magnetic flux in the individual rod position indicator coil that induced a voltage on the secondary side of the coil. The secondary coil voltage is used to provide the relative rod position and as such any error introduced will directly affect the rod position indication. The rod position indication would have eventually decreased to indicate full insertion through natural decay of the residual magnetic flux. De-energizing the individual rod position indication system let the residual flux decay almost immediately. The individual position indicator was calibrated during the outage.

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## 17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

## DESCRIPTION OF OCCURRENCE (cont'd)

Analysis of computer data indicated that the turbine over speed circuit initiated an overspeed signal at 103% and tripped the main turbine as designed. Turbine speed was a constant 1800-rpm as controlled by the electric grid with the generator synchronized to it.

The unit was returned to service the following day, March 9, 2006.

The automatic initiation of the reactor trip and the manual initiation of the Main Steam Line Isolation are reportable in accordance with 10CFR50.73(a)(2)(iv)(A), "any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B)."

## PREVIOUS OCCURRENCES

A review of reportable events for Salem Generating Station in the last three years identified five licensee event reports associated with manual or automatic reactor trips.

311/2004-006 "Salem Unit 2 Reactor Trip Due to a Malfunction of a Main Feedwater Regulating Valve (21BF19)," dated September 13, 2004.

311/2004-007 "Salem Unit 2 Reactor Trip Due to a Malfunction of a Main Feedwater Regulating Valve (23BF19)," dated September 13, 2004.

311/2003-001 Salem Unit 2 "Manual Reactor Trip Due to Degradation of Condenser Heat Removal," dated May 22, 2003.

311/2003-003 Salem Unit 2 "Manual Reactor Trip Due to Dropped Control Rod," dated January 20, 2004.

272/2003-002 Salem Unit 1 "Reactor Trip due to Turbine Trip Caused by a 500KV Switchyard Breaker Trip," dated September 24, 2003.

Although these events involved a reactor trip, the root causes were different than the one described in this LER; and therefore they could not have been prevented this occurrence.

## LICENSEE EVENT REPORT (LER)

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## 17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

## CAUSE OF OCCURRENCE

The investigation team explored several possible failure methods which could have resulted in the turbine overspeed trip and determined that the most probable cause was Radio Frequency Interference (RFI) or Electro Magnetic Interference (EMI) by an unknown source.

Efforts to pinpoint the source of the interference signals are continuing. Due to the length of cable associated with the turbine speed circuit and the transient nature of the interference, the investigation team has not identified the specific device and location that initiated the EMI/RFI.

This event identified the potential vulnerability of the digital EHC system to RFI/EMI. Tests conducted on the simulator EHC system demonstrated that interference could be induced into the EHC system. The three turbine overspeed conductors (channels) are routed together in a single cable.

## SAFETY CONSEQUENCES AND IMPLICATIONS

There was no actual safety consequences associated with this event.

As stated earlier, later assessments following the reactor trip determined that the control rod indication was erroneous and that the leak on the condensate line was due to the momentary secondary system pressure perturbation caused by the trip. The licensing basis of the Salem plant includes the assumption that the highest worth control rod is stuck completely out of the core; therefore, the current licensing basis accident analyses bound this event.

A review of this event determined that a Safety System Functional Failure (SSFF) as defined in NEI 99-02, Regulatory Assessment Performance Indicator Guidelines, did not occur.

## CORRECTIVE ACTIONS

Use of electric tools, radios, cellular phones, portable radios, arc flash welders and other equipment that could result in EMI or RFI in relay rooms has been prohibited.

Warning signs have been posted in the effected areas. Adherence to the posting is being emphasized to prevent EMI and RFI from interfering with or causing inadvertent actuation or response of sensitive instruments in the plant.

Longer term actions such as additional cable shielding or cable separation are being evaluated as well as the extent of the entire digital EHC circuit susceptibility to EMI/RFI.

## COMMITMENTS

No commitments are made in this LER.